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ABSTRACT

The main purpose of these two studies was to determine whether or not generating good comprehension questions while studying prose material was an effective study technique. In the first study there were two treatment groups to which the high school seniors participating in the study were randomly assigned: a questioning-with-training or a read-reread control group. In the second study, high school juniors and seniors were randomly assigned to one of three treatment groups: a questioning-with-training group, an untrained questioning group, or a read-reread control group. Verbal ability, as measured by the "Wide Range Vocabulary Test," was used to group subjects ex post facto into three levels of verbal ability. Two sessions of approximately 50 minutes each were used for training and testing the subjects. The first day was devoted to training the experimental groups and administering the verbal ability test. On the second day, students studied two 450-word passages and were tested over their content. Findings from one of the studies showed a significant main effect for treatment in favor of questioning-with-training. Further, results from both studies indicate that student generation of questions during study is more effective for lower than for higher verbal ability students. (Author)

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CENTER FOR THE STUDY OF READING

Technical Report No. 87

The Development and Evaluation of a Self-Questioning Study Technique

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The Development and Evaluation of a Self-Questioning Study Technique

There is wide agreement that active involvement of the student in the reading process facilitates learning from text. Thorndike (1917) suggested that oral exercises be replaced by silent reading during which the student should be guided "to find the answers to given questions, or to give a summary of the matter read, or to list the questions which it answers..." (p. 332).

Since the time of Thorndike, many reading strategies have been devised to guide the reader in studying texts. One step frequently included in many of these strategies is the use of questions (Bird & Bird, 1945; Frederick, 1938; Frederick, Kitchen, & McElwee, 1947; Gerken, 1953; Morgan & Deese, 1957; Muse, 1929; Robbins, 1957; Robinson, 1961; Smith 1939; Wrenn & Larsen, 1955). The process of using questions during study may take two forms: (a) students answer questions constructed by the teacher or other source, such as the text author; (b) students generate questions covering material read.

Author- or teacher-generated questions are acknowledged to be an aid in assisting students to master the content of a selection. Since the investigations of Washburne (1929) and Holmes (1931), a large number of studies have shown that experimenter-constructed questions facilitate comprehension and recall of textual materials. These studies have been concerned with the effects, nature, and type of adjunct questions as well as their location and frequency within the prose passage (e.g., Boker, 1974; Bruning, 1968; Felker & Dapra, 1975; Frase, 1967, 1968; Frase, Patrick, & Schumer, 1970; Rothkopf, 1966;

Rothkopf & Bisbicos, 1967; Watts & Anderson, 1971). There has also been some interest in how supplied questions interact with individual differences (Hiller, 1974; Sanders, 1973; Shavelson, Berliner, Ravitch, & Loeding, 1974). Anderson and Biddle (1975) recently reviewed the literature on adjunct questions and indicated that, in general, experimenter-constructed questions have a facilitative effect on prose learning. It seems that this enhancement is greater when questions are placed after the material to which they refer. Further, the benefits tend to be stronger when constructed answers rather than multiple-choice items are used as adjunct questions. In addition, high level-questions--questions which require comprehension of the text and application of principles and concepts to new situations--seem to prompt more thorough study and thus improve learning and retention.

But where author- or teacher-generated questions are not available, "the possibility still exists that students can direct their own attention to relevant material through self-questioning" (Morse, 1975; p. 2). Some educators have stressed that students should be encouraged to ask their own questions in order to develop as independent readers (Bernstein, 1973; Dansereau, McDonald, Long, Actkinson, Ellis, Collins, Williams, & Evans, 1974; Frase & Schwartz, 1975; Smith, 1972). Until recently, the studies of pupil-constructed questions tended to focus on the development of inquiry skills and problem solving behavior. Little research has been conducted on the effects of student-generated questions within the context of reading or prose learning.

Among the several studies which show facilitative effects for student-generated questions are two reported by Frase and Schwartz (1975). In

Experiment 1, 48 high school students read a 1,213-word biographical passage which was divided into three sections of approximately 400 words each. Subjects were assigned to 24 tutorial pairs and received instructions to ask their partners questions on one-third of the text, answer their partner's questions on another third, and study the other third on their own. Each subject answered the 90-item short-answer posttest, which was tape recorded. The questions constructed by students were compared to posttest items; the test items were classified either as "targeted" (similar to a student question), "nontargeted," or control (covering the material that the student read without questions). Mean total recall for answering, questioning, and studying conditions was 54.1%, 52.4%, and 46.8%, respectively. The means of the answering and questioning conditions differed significantly ($p < .01$) from the studying-only condition mean, but did not differ significantly from one another.

In Experiment 2, 64 college freshmen read the same passage and took the same test as in the first experiment, except that only the first two sections of the text and the first 60 items of the test were used. The subjects were required to read one text section and construct questions about it and then to study the other section without questions. The mean proportion correct on the posttest for the question-generation condition was .60 and for the studying-only condition, .53. The difference was significant at the .005 level. The mean proportion correct for the targeted, nontargeted, and control items were .72, .55, and .53, respectively, a difference which is significant at the .001 level. As in Experiment 1, scores on nontargeted items did not differ from scores on control test items.

Recently, Duell (1977) examined the effectiveness of asking subjects to generate test items while reading four 552-word passages describing the psychological processes of shaping, negative reinforcement, prompting, and overlearning. One hundred and three college students were randomly assigned to three experimental groups. Group 1 received the four passages, a list of objectives, and instructions to write items to match the objectives. Group 2 was instructed to study the passages with a list of behavioral objectives. Control group students were directed to take the criterion test without reading the passages. Two types of questions were used in the 31-item multiple-choice posttest. There were lower level, or recognition, items which required the subjects to recognize an example of a psychological process copied from the text. The high level, or application, items presented new examples of a process and asked subjects to identify the name of the process represented by the example. Posttest data revealed a significant advantage for the item-generating group. Writing questions for both low and high level objectives produced more learning than studying with objectives. Item-generating learners scored significantly higher than learners who received only the list of objectives.

In an investigation by Schmelzer (1975), 159 college students read a 1,488-word passage from a college textbook in logic. Group 1 was instructed to preview the passage for five minutes and then to generate five questions. Group 2 was given the passage, which was divided into five sections, and told to read each section and then construct a question covering the material contained in that particular section. Group 3 was instructed to read the entire passage and then generate five questions over the material read. Group 4

received instructions to read the passage twice. A 21-item multiple-choice criterion test was administered immediately after the treatment. Although the effects were not strong, there is evidence that the post-questioning group scored higher than the other groups.

In several studies, the student-generated questions treatment had no effect. Specifically, Pederson (1976) used Schmelzer's (1975) materials and failed to replicate the earlier results. In addition, Bernstein (1973), Morse (1975), and Owens (1977) were unable to find an effect for student questioning.

Even though Frase and Schwartz (1975) and Duell (1977) present convincing evidence that the question generating technique is effective, they included several conditions which make the technique less than appealing for independent studying. Duell had her students construct multiple choice questions with the aid of instructional objectives. These aids and procedures helped the students to determine the exact text content on which to base the questions, and the format of the question. Frequently, however, students do not have these aids available. On the other hand, Frase and Schwartz did not supply the student with many aids, but they used text material which was so factually dense, that virtually all of the generated questions were related to knowledge of these facts (Frase, Note 1), and not to higher ordered knowledge.

It remains to be demonstrated that (a) students can be trained to locate sections of text material which contain important main points and generate questions about them, and (b) that the process of generating such questions will facilitate learning the material. Consequently, the first experiment was designed to assess directly whether the treatment was effective or not.

Experiment 2 was designed to replicate the findings of Experiment 1 with a larger sample size, and to assess the relative importance of carefully training students to become good question generators in comparison to students who simply are 'told' to use the questioning technique.

EXPERIMENT 1

Method

Design

The design involved two between-subject factors and one within-subject factor. The between-subject factors were study technique (questioning-with-training and rereading) and verbal ability (high and low). The within-subject factor was the item type in the posttest. Subjects scoring above the 50th percentile on the Wide Range Vocabulary Test (French, Ekstrom, & Price, 1963) were classified as higher verbal ability students and those falling below the 50th percentile were classified as having lower verbal ability.

Subjects

The sample consisted of 29 seniors at a rural high school in central Illinois. They participated in this study using time from their regular English curriculum.

Materials

Reading passages. Three 450-word passages describing the principles of displacement, extroversion-introversion, and drive reduction were used. The passages were adapted from those employed in Watts and Anderson's (1971) study. All three passages are similar in organization and style. In the first paragraph the principle is introduced, and a situation which illustrates

the principle is presented in common language. The second paragraph names the psychologist with whom the principle is associated and gives a technical explanation of the principle. In the third paragraph a new situation illustrating the principle is presented. The last paragraph introduces a related concept and provides a concluding sentence.

Readability for the three passages was measured using the Dale-Chall Readability Formula (Dale & Chall, 1948). All three passages were assessed to be between the ninth and twelfth grade levels, which are usually judged as appropriate levels for high school juniors and seniors. Since the period of time available for student study did not allow the use of all three passages, each student received a random combination of any two passages and a set of 20 questions related to them.

The self-questioning training program. Each subject in the questioning condition received a booklet with directions and instructional materials for self-directed study. Training booklets included: (a) a brief introduction to the questioning technique and a description of steps that should be followed in studying a text; (b) an experimenter's model paragraph illustrating the appropriate use of the technique; (c) several single paragraphs and a two-paragraph passage designed to give the students practice in constructing questions about material read; (d) experimenter-provided examples of questions that could have been generated for those paragraphs; and (e) a short passage--about 450-words--with instructions for students to apply the questioning technique. This passage was presented in the left half of the page in order to leave sufficient blank space at the right margin for the students to write their questions. The next page showed questions produced

by the experimenter as an example of the correct application of the questioning procedure over the same material. The purpose of these experimenter-generated questions was to serve as examples of good question construction for students. Students' difficulties during the training session with the materials and/or procedures were handled by the experimenter on an individual basis.

Students were taught how to generate questions using procedures similar to those reported by Anderson, Anderson, Dalgaard, Wietecha, Biddle, Paden, Smock, Alessi, Surber, and Klemt (1974). First, the students were instructed to identify the main idea of each paragraph, which would serve as the core of the questions. Second, students were given specific directions to form questions which asked for new instances of ideas and/or concepts. Last, when generating a new instance proved difficult or inappropriate, the question was to be about a concept in the text, but in a paraphrased format.

Criterion Posttest

The criterion measure was a 20-item constructed-response-type achievement test. Ten items were constructed for each of the three passages, but only 20 items were used for any one student since each student read only two passages. One-half of the items assessed passage main ideas and the other half assessed details. Each test item was typed on a separate page and the order of the items was determined randomly.

The main-idea items were prepared following strictly the same procedure outlined in the student's training program. Whenever possible, the items entailed application of main-point concepts and/or principles to new examples.

In general, the language of the main-idea items did not repeat substantive words (nouns, verbs, modifiers) found in the instructional passages.

The detail questions, (one for each of the four text paragraphs), were framed with one of the following interrogative words: which, who, when, where, what, or how. In order to answer these questions correctly, the student had to recall specific information (or facts) from the text, such as names, technical terms and dates.

Experimental Procedures

This study was conducted on two consecutive days. Two sessions of approximately fifty minutes each were used for training and testing the subjects. The first day was devoted to training the experimental groups and administering the verbal ability test. In order to facilitate monitoring of the training session, the subjects were organized into two classrooms according to their assigned conditions. (The experimenter was given a list containing all students' names so that subjects could be randomly assigned to one of the two groups in advance.) First, the students were informed about the purpose of the research and were told that their participation in the study should be voluntary. Then all subjects were given the Wide Range Vocabulary Test (French et al. 1963). The instructor read the directions aloud and told subjects that they were allowed seven minutes to complete the thirty multiple-choice test items. Upon completion of the vocabulary test, the training materials, assembled in randomly ordered booklets, were distributed to the students. The first page of the booklet contained specific directions for the group. Two different sets of directions

were written: one for the questioning-with-training group and the other for the reading-rereading group. The directions informed the subjects that they were either to learn the questioning technique, or to read and reread the passages. Subjects recorded the amount of time spent studying the experimental passage and the entire set of materials.

The second session required all students to read two experimental passages, perform the tasks described in the testing booklets, and take the criterion test. The students were again organized into two different classrooms which included subjects from each of the two treatment groups. Treatment Group 1 was instructed to use the self-questioning technique while studying the texts. The directions for this group presented an outline of the steps that should be followed while using the questioning method. Treatment Group 2 was required to read and reread the passages. Both groups were told to read the passages in preparation for a later constructed-response-type test and were given thirty minutes in which to complete the tasks. Each student recorded the amount of time taken to study the passages. As soon as each student completed the materials, he or she was given the criterion task.

Scoring and Analysis

The basic dependent measure for this study was the number of items correctly answered in the criterion posttest. The criteria for scoring the posttest were based on the rules for scoring constructed-response-type items suggested by Gronlund (1968). An outline of the expected answers was prepared including the key points of each response, and the amount of credit to be allotted to it and to the parts within it. The answers were scored

by the point method; that is, the number of points assigned to each answer was determined by the previously prepared scoring key. In addition, all of the students' answers to one question were evaluated before proceeding to the next question. Finally, the main-idea items were graded by at least two independent judges in order to check the reliability of the scoring process. When there was disagreement between the two ratings, a third independent judge was asked to evaluate the item and the decision was based on the consensus of the group.

The posttest scores were analyzed by two three-factor unweighted means analyses of variance with repeated measures on one factor, i.e., the item-type factor. Another source of data, the amount of time taken by the subjects to study the passages, was analyzed by a t-test. Finally, the questions generated by the students were examined and evaluated (on a scale from 0-4) according to the rules for constructing good comprehension questions which were presented in the students' self-questioning program. Analyses were carried out to estimate the conditional probability of scoring posttest items correctly, given that a good comprehension question matching the specific item had been written. These analyses were done for every question constructed by the students and their matching main-idea test items. In addition, the percentage of good comprehension questions generated by the questioning group was calculated.

Results

The posttest scores were analyzed by a 2 x 2 x 2 fixed effects analysis of variance with repeated measures on the last factor. The factors were study

technique, verbal ability and type of posttest item. Results showed significant main effects for verbal ability and item type, but not for treatment. Significant two-way interactions were disclosed for Treatment x Verbal ability, $F(1,23) = 4.38$, $p < .05$ and for Item type x Verbal ability $F(1,23) = 4.93$, $p < .05$. The latter interaction is not relevant to the scope of this study, but the former needs more discussion. The question-generation strategy affects the test performance of low verbal ability students more than it affects the performance of high ability students. The low ability questioning group scored higher ($M = 13.66$) than the low ability read-reread group ($M = 8.26$), while the high ability students scored about the same whether they used questions ($M = 18.67$) or read-reread ($M = 20.88$).

The self-questioning group spent significantly more minutes ($M = 19.54$, $SD = 5.04$) studying the experimental passages than did the rereading group ($M = 8.69$, $SD = 2.89$), $t(27) = 7.28$, $p < .0005$. The low verbal ability questioning group spent approximately the same amount of time ($M = 19.17$, $SD = 2.71$) studying the texts as did the high verbal ability questioning group ($M = 18.17$, $SD = 5.15$). The low rereading group studied the passages ($M = 9.29$, $SD = 3.64$) approximately as long as the high verbal ability rereading group ($M = 8.63$, $SD = 2.07$). The difference on test performance between high and low verbal ability students thus does not seem to be attributed to the amount of study time.

The student-generated questions were analyzed according to the criteria for constructing good comprehension questions described in the self-questioning program. From a total of 148 questions written by students during the training session, 75% were considered good comprehension questions. In the passages used for testing, from a total of 118 questions, 74% were classified as good

comprehension questions. Further analyses were undertaken to examine the relationship between study questions and performance on the corresponding criterion test items. It was found that the probability of answering a posttest item correctly, after having generated a good text-based question, was .78. The probability of answering a posttest item correctly when a less than adequate question had been generated was .39.

EXPERIMENT 2

Method

Design and Analysis Plan

The main design was a 3 x 3 x 2 factorial analysis of variance with repeated measures on the last factor. The between-subject factors were study technique (questioning-with-training, questioning, and rereading) and verbal ability (low, middle, and high). The within-subject factor was item type in the posttest (main-idea and detail). The dependent variable was score on the immediate posttest. Subjects were randomly assigned to one of the three treatment groups. Verbal ability, as measured by the Wide Range Vocabulary Test (French et al., 1963), was used to group subjects ex post facto into three levels of verbal ability.

Subjects

The sample consisted of 81 juniors and seniors from the high school in a farming community in central Illinois. Ten students who did not follow directions, that is, who did not perform the experimental tasks described in their materials, were dropped from the study.

All students were enrolled in classes considered as average or above average in achievement level. There were 46 females and 25 males from 16

to 18 years of age who were in the eleventh (35%) or twelfth (65%) grade. The subjects were randomly assigned to one of the three experimental groups.

Materials

The reading passages and training materials used in Experiment 1 were also used in Experiment 2, with a few modifications to the training materials. The major modification was to replace the practice passage at the end of the training materials with one of the three reading passages. This meant that each student practiced on one of the passages and received the other two for experimental purposes on a subsequent day. Consequently, all three passages were used for practice and experimental purposes.

Criterion Posttest

The criterion posttest was a 24-item constructed-response-type achievement test. Items used in Experiment 1 were also used in Experiment 2. Eight items were constructed for each of the three passages. One-half of the items assessed passage main ideas and the other half assessed details. Each test item was typed on a separate page and the order of items was determined randomly. Sixteen of the items measured recall of the experimental passages and eight items assessed retention of the passage studied during the training session.

Experimental Procedures

Similar experimental procedures were used in the two experiments, but an additional experimental group was added. Students in this group received no special training on how to construct questions, but when they studied the two experimental passages they were asked to construct four questions on each

passage. The instructions told subjects that their questions should be the type they would expect an instructor to construct over the same material.

Consequently, there were three experimental groups: (1) a read-reread group; (2) a questioning group with no question-generation training; and (3) a questioning group with question-generation training.

Scoring and Analysis

Scoring and analysis procedures in Experiment 2 were very similar to those in Experiment 1, with the primary difference being that the design had three treatment conditions and three verbal ability groups as compared to two in Experiment 1.

Results

The questioning-with-training group (M = 14.79, SD = 4.56) and the untrained questioning group (M = 13.70, SD = 5.02) obtained higher scores on the posttest than the rereading group (M = 11.42, SD = 6.58). An analysis of variance on the posttest scores revealed significant main effects for both treatment, $F(2,62) = 3.81$, $p < .03$ and verbal ability, $F(2.62) = 27.01$, $p < .001$. A Tukey's post hoc analysis showed a significant difference ($p < .03$) between total mean scores for the questioning-with-training group and the rereading control group. The total mean scores for the two questioning groups did not differ from each other. The difference in mean scores between the untrained questioning group and the rereading group approached significance ($p < .06$). The verbal ability main effect indicates that high verbal ability subjects performed higher on the posttest than low verbal ability subjects.

The failure to find the Treatment by Ability level interaction found in Experiment 1, prompted a closer look at the cell means and standard deviations. It then became obvious that the middle ability group had consistently larger standard deviations (exceptionally high and low scores) than the approximately equal standard deviations of the high and low ability groups. Since there was no covariate measure to control statistically for that variance, it was decided to investigate the possibility of a Treatment x Verbal ability interaction by performing another ANOVA using the three treatment groups, two verbal ability groups (the middle group was eliminated), and two item types. This analysis yielded the following results: a significant interaction between treatment and verbal ability, $F(2,40) = 3.81$, $p < .05$; a significant interaction between item type and verbal ability $F(1,40) = 15.20$, $p < .005$; and significant main effects for treatment $F(2,40) = 4.76$, $p < .01$ and verbal ability, $F(1,40) = 71.92$, $p < .001$.

As explained earlier, 'good comprehension questions' are those which are based on main points of text paragraphs, require new examples of ideas or concepts presented in the instructional materials and/or paraphrase the text statements. All of the student-generated questions were rated according to those criteria.

In order to determine statistically whether the trained group generated better questions or not, an analysis of variance was carried out using the two questioning groups and three levels of verbal ability as factors. The dependent variable was percentage of good comprehension questions.

The results show one significant effect, the main effect for treatment, $F(1,41) = 6.06$, $p < .025$. The questioning-with-training group ($M = 72$, $SD = 23$)

generated a significantly greater percentage of good comprehension questions than the untrained questioning group (M = 57, SD = 21), $F(1,41) = 6.06$, $p < .025$.

The questioning-with-training group (M = 16.67, SD = 4.28) and the untrained questioning group (M = 14.17, SD = 4.84) spent significantly more minutes studying the material than did the rereading group (M = 8.16, SD = 3.08), $F(2,66) = 25.268$, $p < .00005$. A Scheffé post hoc analysis revealed significant differences ($p < .005$) between questioned and unquestioned groups.

In order to examine the relationship between time and the performance of the questioned groups, multiple regression analyses were carried out using amount of time and percent of good comprehension questions as predictors of achievement. For the untrained questioners, the correlation between time and performance on the test was low and negative, -.29, $p > .05$. However, the correlation for percentage of good questions and test scores was .37, $p < .05$. The regression analysis (Mult. R = .51) revealed that percentage of good comprehension questions was a significant predictor of achievement, $t(20) = 2.17$, $p < .05$, but time was not, $t = -1.8$, $p > .05$. For the trained questioning group, the correlation between amount of study time and achievement was .11, $p > .05$, whereas the correlation between percentage of good comprehension questions and test scores was .62, $p < .01$. Again, the regression analysis (Mult. R = .62) revealed that only the percentage of good questions was a significant predictor of test performance, $t(21) = 3.58$, $p < .005$.

In additional analyses, it was found that the probability of correctly answering a question on the posttest, given that a matching good comprehension

question had been constructed during the study period, was .80 for both the trained and the untrained group. The mean proportion correct with less than adequate questions generated during study was .56 and .58 for the trained and untrained questioners, respectively. Furthermore, the mean proportion of test items answered incorrectly when a good comprehension question had been generated was .20 for both groups, and the mean conditional probability of answering a criterion test question incorrectly when a less than adequate question had been generated was .44 and .42 for the trained and untrained questioning groups, respectively. It is worth noting that the proportion of items correctly answered with less than adequate questions is related to a small proportion of less than adequate questions, that is, .27 and .43 for the trained and untrained groups, respectively.

Finally, the reliability (KR-21) for the criterion test was .84. Main-idea items had a KR-21 of .82, and detail items had a KR-21 of .59.

DISCUSSION

The results of this investigation indicate that self-generation of questions during study can lead to improved performance on a test of comprehension. Findings show a significant main effect for treatment (study technique) in favor of the questioning-with-training group. Further, results show that the untrained questioning group obtained higher posttest scores than the rereading control group, albeit the difference in mean scores was not statistically significant. No significant differences were found between means of the groups that generated questions.

There are several possible explanations for the beneficial effects of the self-questioning study technique. One explanation could be the levels-

of-processing notion of cognitive psychology (Craik & Lockhart, 1972). According to this theory, input is analyzed in a hierarchy of processing stages, where increasing "depth" implies a greater degree of semantic or cognitive analysis and hence greater retention. This depth of processing explanation for memory effects has been offered in studies by Watts & Anderson (1971), Anderson & Biddle (1975), Felker and Dapra (1975), and Andre and Sola (1976). The explanation may also be applicable to the present study: The superior criterion test performance by the groups who constructed main idea questions (either with or without training) compared to the rereading control group may be due to the fact that determining main ideas and transforming them into questions necessarily entails a deeper semantic analysis of the text than does simply reading and rereading the text.

A second possible explanation for the results is that the improved retention of textual materials by the questioned groups is simply a function of extended study time (Faw & Waller, 1976). Even though an equal amount of study time was allocated to the three treatment groups, the questioned groups reported a significantly greater amount of effective study time than the rereading control group. On the average, about twice as much time was spent questioning than rereading.

Additional analyses were then performed to assess the correlational effects of study time on test performance. The results of correlational analyses between amount of study time and criterion test scores disclosed a negative low correlation for the untrained group and a very low correlation for the trained group. Apparently, 'within group performance' on the comprehension test is not associated with the amount of study time. Findings

from multiple regression analyses using study time and percentage of good questions as predictors of comprehension scores suggest that study time, again, was not a significant predictor of achievement. The significant predictor in those analyses was the percentage of good comprehension questions.

A final explanation for the effectiveness of the main-point self-questioning technique is the combination of its metacognitive and cognitive characteristics. Anderson (1978) suggests that self-generation of questions may be an effective reading strategy because the student is forced to (a) pause frequently, (b) deal with an "understanding question," (c) determine whether or not comprehension has occurred, and (d) decide what strategic action should be taken next. The process of self-awareness and conscious control of the study activity is an illustration of the metacognitive aspect involved in the self-questioning strategy. This prospective broadens the levels-of-processing notion by stressing the reader's active role in the monitoring of activities and in the development of strategies to remediate comprehension failures. The self-questioning study technique includes components that may affect the metacognitive and cognitive behaviors of students. It is a technique that encourages the reader to (a) set purposes for study; (b) identify and underline important segments of the material; (c) generate questions which require comprehension of the text to be correctly answered; and (d) think of possible answers to the questions. The questioning strategy leads the student to an active monitoring of the learning activity and to the engagement of strategic action to achieve efficiency (Anderson, 1978;

Brown, 1978). This seems to be a plausible reason for its demonstrated effectiveness.

The use of questions during study appears to be particularly beneficial for low verbal ability subjects as evidenced by the significant interactions. Low verbal ability subjects may profit most from question generation because their usual study behaviors are less adequate; therefore, making use of an efficient study technique affects their criterion test performance. Rothkopf (1972) suggested that adjunct questions would have the most effect if inspection activities were ineffective or deteriorating. The same may be true for the effects of the self-questioning strategy. The low ability students improved their performance because they were asked to use a study strategy which is more effective than the one they would normally use. Apparently high verbal ability students already have the component skills included in the self-questioning study technique and their posttest performance was not affected by the use of the method.

How effective was the question-generation training procedure? Findings indicate that students taught to generate main-idea questions constructed a significantly greater percentage of good questions than students who received no training. These results suggest that students can be trained in the skill of generating main-point questions and the training procedure appears to be effective in increasing the students' ability to construct good questions.

The results in terms of verbal ability groups suggest that the training procedure helped more low and middle verbal ability students yet did not greatly influence high verbal ability subjects. It seems that high ability

subjects already know how to generate good questions, for trained and untrained subjects constructed approximately the same percentage of good comprehension questions. Students in the middle verbal ability group most improved their ability to raise good questions, followed by the low ability group. The general conclusion of these findings is that the question-generation training procedure helps low and middle verbal ability students to generate main-idea questions, but does not alter the performance of high verbal ability students.

The analysis of students' protocols revealed that a major difference between trained and untrained questioners was the ability to construct new example--or application--questions. The students in the untrained questioning group generated very few new-example-type questions.

In conclusion, these data support the contention that student generation of questions during study produces greater learning than the rereading method of study. Findings indicate that training students to generate main-idea questions may enhance their comprehension of written materials. it seems that the benefits of the self-questioning study technique are greater for lower verbal ability students than for students having higher verbal ability. Further, the training procedure seems to improve the students' skills in constructing good comprehension questions. The data show high probabilities of correctly answering a question in the criterion test provided that a good comprehension question was generated for that topic during the study period.

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